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## Making a Finished Product from Metal (National 4)

**SCQF:** level 4 (6 SCQF credit points)

**Unit code:** H25T 74

### Unit outline

This is the Added Value Unit in the National 4 Practical Metalworking Course. The general aim of this Unit is to enable the learner to provide evidence of added value for the National 4 Practical Metalworking Course through the successful completion of a practical activity which will allow the learner to demonstrate breadth, challenge and/or application.

Learners who complete this Unit will be able to:

- 1 Produce and apply a finish to a product in metal

This Unit is a mandatory Unit of the National 4 Practical Metalworking Course and is also available as a freestanding Unit. The Unit Specification should be read in conjunction with the *Course Support Notes*, which provide advice and guidance on delivery and assessment approaches. Exemplification of the assessment in this Unit is given in the *National Assessment Resource*.

### Recommended entry

Entry to this Unit is at the discretion of centre. It is recommended that the learner should be in the process of completing, or have completed, the following Units of the National 4 Practical Metalworking Course:

- ◆ Practical Metalworking: Bench Skills (National 4)
- ◆ Practical Metalworking: Machine Processes (National 4)
- ◆ Practical Metalworking: Fabrication and Thermal Joining (National 4)

## **Equality and inclusion**

This Unit Specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence. For further information, please refer to the *Course Support Notes*.

# Standards

## Outcomes and assessment standards

### Outcome 1

The learner will:

#### 1 Produce and apply a finish to a product in metal by:

- 1.1 Selecting and using, with guidance, a range of common metalworking tools, equipment and materials as appropriate
- 1.2 Using, with guidance, bench skills in marking out, cutting and shaping metalwork components
- 1.3 Using, with guidance, machine processes skills in marking out, cutting and shaping metalwork components
- 1.4 Using, with guidance, fabrication and joining techniques in fabricating and joining metalwork components
- 1.5 Manufacturing, with guidance, a metalwork product to given drawings and to given standards
- 1.6 Selecting and applying, with guidance, an appropriate finish to the product
- 1.7 Working in accordance with recognised procedures and safe working practices

## Evidence Requirements for the Unit

This Unit will be assessed through controlled assessment which meets the Evidence Requirements below.

The assessment method for this Unit will be a practical activity in which the learner will draw on and apply the skills and knowledge related to bench skills, machine processes and fabrication and thermal joining techniques.

The practical activity will assess the learner's skills in: reading and interpreting given working drawings and outline specification information; checking materials supplied against the requirements of the drawings; marking out, cutting, shaping and fitting metal sections and sheet materials in readiness for fabrication and joining; assembling, fitting and fixing the components into a whole to form the product; and applying an appropriate finish.

This practical activity is:

- ◆ set by centres within the SQA guidelines described below
- ◆ conducted under some supervision and control

Evidence will be internally marked by centre staff in line with SQA guidelines.

All assessment is subject to quality assurance by SQA.

### Setting the assessment

The practical activity will be set by centres within the following guidelines:

- ◆ The specification for the practical activity will be agreed between the learner and the teacher.

- ◆ The teacher will provide overall guidelines for the practical activity and a list of questions/tasks/prompts which will lead learners through the practical activity in clear stages.
- ◆ The practical activity will be a meaningful and appropriately challenging task, which should clearly demonstrate application of knowledge and skills, at an appropriate level, drawn from the *Bench Skills* Unit, the *Machine Processes* Unit and the *Fabrication and Thermal Joining* Unit (as defined in the 'Further mandatory information on Course coverage' section of this document).
- ◆ The practical activity will involve making a metal product consisting of a minimum of five component parts and will require the learner to provide evidence of bench skills, machine processes and fabrication and joining techniques.
- ◆ The use of at least one thermal joining technique is mandatory in the practical activity.
- ◆ The working drawings for the practical activity will not detail every aspect of the product. This will allow the task to be sufficiently open and flexible to allow for personalisation and choice. It will thus allow learners to demonstrate practical creativity.

### **Conducting the assessment**

The practical activity will be conducted under some supervision and control. This will take the form of the following:

- ◆ The practical activity will be carried out under supervised open book conditions.
- ◆ The teacher may also give learners some support and guidance, as appropriate to National 4 level, to help them progress through each stage of the practical activity. The amount of support provided should be reflected in the assessment judgement.

### **Judging the evidence**

Evidence will be internally marked and verified by centre staff in line with SQA guidelines.

All assessment is subject to quality assurance by SQA.

Learners will provide evidence of the following:

- ◆ Following appropriate procedures and processes in the manufacture of the product by:
  - selecting metalworking tools, equipment and materials appropriate for tasks
  - checking materials supplied against the working drawings
  - confirming that metalworking tools and equipment are in good condition and safe working order before, during and after use
  - marking out each component part in accordance with the working drawings and with four functional dimensions within specified tolerance
  - assembling, joining and fitting the overall product, in accordance with the working drawings and with six functional dimensions within specified tolerance
  - the thermal joining within the manufacture of the product must be reasonably consistent in quality and form; there is no minimum length requirement for this work

- selecting, and applying an appropriate finish and to a reasonable standard without major flaws
- using tools and equipment in accordance with recognised procedures and safe working practices

- ◆ It is assumed the completed product will be easily portable. The standards and tolerances applicable to the product are in line with those shown in the following Unit Specifications:
  - Practical Metalworking: Bench Skills (National 4)
  - Practical Metalworking: Machine Processes (National 4)
  - Practical Metalworking: Fabrication and Thermal Joining (National 4)
- ◆ A record of progress through the practical activity (such as an informal diary or electronic log or blog) produced by the learner. Information in the diary should include when tasks are completed, areas that have been an issue for the learner, safe working practices, and strength and weaknesses. The diary should also indicate where practical creativity has been demonstrated.

### **Re-assessment**

In relation to Unit assessment, SQA's guidance on re-assessment for Units applies.

Further information is provided in the exemplification of assessment in the *Unit Assessment Support*. Advice and guidance on possible approaches to assessment is provided in the *Course Support Notes*.

## **Development of skills for learning, skills for life and skills for work**

Please refer to the *Course Specification* for information about skills for learning, skills for life and skills for work.

## Further mandatory information on Course coverage for the National 4 Practical Metalworking Course

The following gives details of mandatory skills, knowledge and understanding for the National 4 Practical Metalworking Course. Assessment of this Added Value Unit will involve selecting appropriate skills, knowledge and understanding from those listed below, in line with the Evidence Requirements. This list of skills, knowledge and understanding also provides the basis for the assessment of all the Units in the Course.

| <b>Identification and skills in use of the following, including associated processes, as appropriate to Unit:</b> |   |
|---|---|
| <b>Measuring and marking out</b>  | <p>Tools and equipment:</p> <ul style="list-style-type: none"> <li>◆ scriber and scribing block</li> <li>◆ steel rule</li> <li>◆ engineer's square</li> <li>◆ spring dividers</li> <li>◆ calipers (odd-leg, inside, outside, and Vernier or digital )</li> <li>◆ centre punch</li> <li>◆ witness marks</li> <li>◆ surface table</li> </ul> <p>Basic knowledge and understanding of:</p> <ul style="list-style-type: none"> <li>◆ units of measurement, datum, functional dimensions</li> <li>◆ Engineer's blue</li> </ul>   |
| <b>Reading and interpreting drawings and documents</b>  | <p>Working drawings, pictorial drawings, diagrams, cutting lists</p> <p>Knowledge and understanding of orthographic projection, scale, dimensioning (linear, radial and diameter) and basic drawing conventions including: line types, centre lines and hidden detail</p>   |
| <b>Materials</b>  | <p>Basic knowledge of a variety of common metalworking materials including:</p> <ul style="list-style-type: none"> <li>◆ ferrous metals (steel, iron)</li> <li>◆ non-ferrous metals (aluminium, copper, nickel)</li> <li>◆ alloys (bronze, brass, stainless steel)</li> <li>◆ common sections (square bar, round bar, hexagonal bar, angle iron, tube)</li> <li>◆ sheet materials (tin plate, copper, brass, steel, aluminium)</li> </ul> <p>Common metals associated with different fabrication and joining techniques</p> |
| <b>Bench work</b>   | <p>Common bench tools, including:</p> <ul style="list-style-type: none"> <li>◆ hammers (ball-pein)</li> <li>◆ cold chisels</li> <li>◆ files</li> <li>◆ saws (senior hacksaw, junior hacksaw)</li> <li>◆ taps, dies, tap wrench and die stock for tapping and threading and awareness of twist drill size</li> <li>◆ rivet set and snap</li> </ul>   |

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|--|--|
| <b>Sheet metal tools and machines</b>              | <ul style="list-style-type: none"> <li>◆ bending equipment including folding bars</li> <li>◆ notchers</li> <li>◆ hide or rubber mallets</li> <li>◆ tin snips</li> <li>◆ pop riveter</li> <li>◆ spot welder</li> <li>◆ formers and jigs (as appropriate)</li> </ul>   |
| <b>Machine processes</b>                           | <p>Centre lathe: parallel turning, facing, chamfering, centre drilling and drilling generally, knurling, parting off</p> <p>Pedestal drill for drilling and counter-sinking</p> <p>Basic knowledge of:</p> <ul style="list-style-type: none"> <li>◆ bench grinders</li> <li>◆ centring of cutting tools</li> <li>◆ milling machines (vertical, horizontal and CNC)</li> <li>◆ industrial cutting processes (including laser and plasma cutters)</li> </ul> |
| <b>Machine tools</b>                               | <ul style="list-style-type: none"> <li>◆ lathe cutting tools</li> <li>◆ knurling tool</li> <li>◆ parting tool</li> <li>◆ 3-jaw chuck and Jacob's chuck</li> <li>◆ chuck keys</li> <li>◆ revolving centres</li> <li>◆ machine vices</li> <li>◆ appropriate holding devices</li> <li>◆ safety equipment</li> </ul>   |
| <b>Finishing</b>                                   | <ul style="list-style-type: none"> <li>◆ Preparation of surfaces</li> <li>◆ Planishing, polishing, bluing</li> <li>◆ Machine finishing (ground, milled)</li> <li>◆ Knowledge (but not use) of preparation and application of painting and dip-coating</li> </ul>   |
| <b>Care and maintenance of tools and equipment</b> | <p>Basic knowledge and understanding of:</p> <ul style="list-style-type: none"> <li>◆ reporting faults and fault reporting systems</li> <li>◆ general condition before, during and after use</li> <li>◆ position and condition of guards</li> <li>◆ position and security of cutting tools on machine tools</li> <li>◆ secure holding techniques</li> </ul>  |
| <b>Fabrication and thermal joining</b>             | <p>Hot-forming techniques including twisting, drawing down and flattening</p> <p>Hot-bending techniques including metal bar bending and metal strip bending</p> <p>Thermal joining techniques including welding, soldering or brazing</p> <p>Mechanical fixing techniques including riveting, screw-fixing and proprietary fixings</p> <p>Proprietary metalwork adhesives</p>  |



|                                     |   |
|-------------------------------------|---|
|                                     |   |
| <b>Safe working practices</b>       | <p>Good practices and safe systems for general workshop and individual activities as appropriate</p> <p>Personal Protective Equipment (PPE)</p> |
| <b>Recycling and sustainability</b> | <p>Best practice in selecting materials appropriate for use</p> <p>Understanding and following workshop recycling practices and processes</p>   |

# Administrative information

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**Superclass:** XD

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## History of changes

| Version | Description of change  | Authorised by                      | Date      |
|---------|--|------------------------------------|-----------|
| 1.1     | Various changes to course coverage table; deletion of need to provide good practice in terms of sustainability and recycling | Qualifications Development Manager | June 2013 |
| 1.2     | Further mandatory information on course coverage<br>Deletion p.7   | Qualifications Manager             | June 2014 |
|         |  |                                    |           |
|         |  |                                    |           |

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